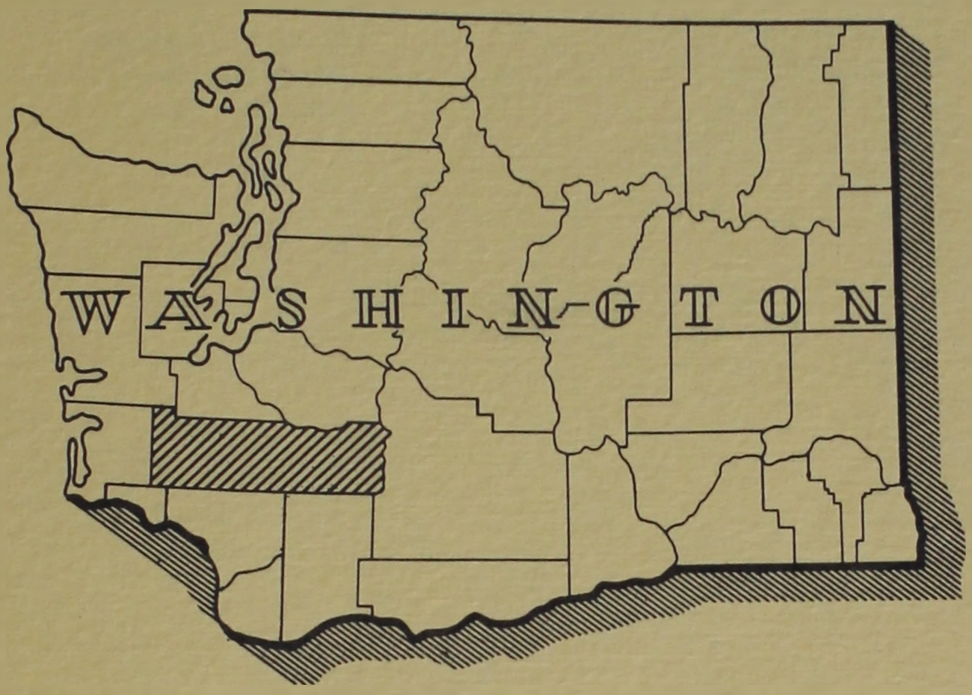
FOREST STATISTICS FOR LEWIS CO., WASHINGTON

FOREST SURVEY REPORT NO. 112



U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
R. W. COWLIN, DIRECTOR

PORTLAND, OREGON NOVEMBER 1953

PREPARED BY THE DIVISION OF FOREST ECONOMICS

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1/ Acknowledgment is made of cooperation from several private and public agencies.

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F. L. Moravets

U. S. Department of Agriculture Forest Service
Pacific Northwest Forest and Range Experiment Station

R. W. Cowlin, Director
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FOREWORD

This publication summarizes in statistical form the results of a reinventory of the forests of Lewis County, Washington, conducted in 1952. This reinventory is a part of the maintenance phase of the Forest Survey, a Nation-wide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928 and amended June 25, 1949. The purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other products on them, to ascertain rates of forest growth and depletion, to estimate present consumption of timber products and to analyze and make available in reports survey information needed in the formulation of forest policies and programs.

The Forest Survey is conducted in the various forest regions of the Nation by the regional forest experiment stations of the Forest Service. In the Pacific Northwest region of Oregon and Washington it is an activity of the Pacific Northwest Forest and Range Experiment Station at Portland, Oregon.

Under the initial phase of the Forest Survey the forests of Lewis County were inventoried in 1931. Later the inventory was adjusted to March 1, 1933 and a statistical report "Forest Statistics for Lewis County, Washington" and a detailed forest type map--scale 1 inch to the mile--were released. In 1939 the first reinventory of the county's forests was made and a revised statistical report and forest type map prepared.

Following the second reinventory, in 1952, the forest type map has again been revised. 1/

1/ A print of the forest type map is available at cost of blueprinting. For information write Director, Pacific Northwest Forest and Range Experiment Station, 423 U. S. Court House Portland 5, Oregon.

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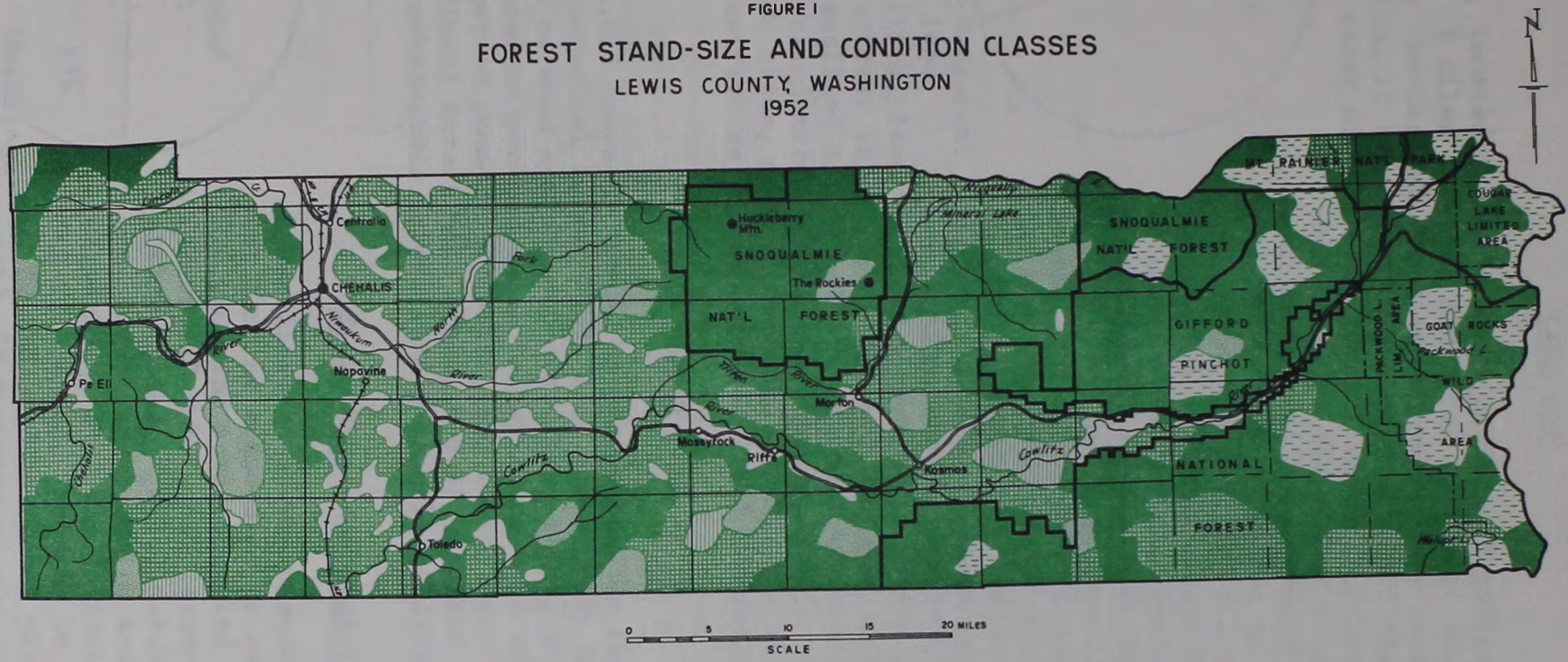
FIGURE 1

FOREST STAND-SIZE AND CONDITION CLASSES

LEWIS COUNTY, WASHINGTON

1952



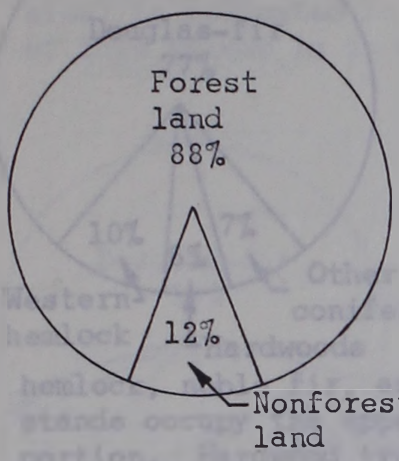
LEGEND

- Saw-timber stands
- Pole-timber, seedling and sapling stands
- Recent clear-cut areas, nonstocked
- Old nonstocked cutovers and burns
- Noncommercial area
- Nonforest land

SIGNIFICANT FINDINGS IN THE FOREST INVENTORY

LAND USE

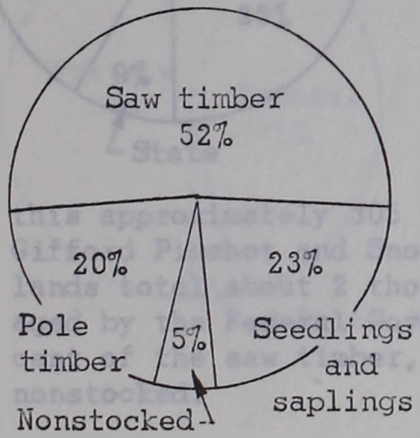
Lewis County, located in the central portion of southwestern Washington, extends some 95 miles from the summit of the Coast Range on the west to the summit of the Cascade Range on the east. The largest county in western Washington, it has a total land area of 1,557 thousand acres. Prior to the event of white settlement, shortly before the middle of the 19th century, the county is estimated to have been almost entirely covered with forests; perhaps only about 1 percent of the area was nonforested. The pattern of land use, dictated by topography, soil and climate, has become quite definitely delineated. During the early decades of settlement logging and clearing of land for agricultural use were closely associated on the level-lying river valleys and low benchlands of the west central portion of the county (fig. 1). As logging moved both westward on the moderate slopes of the Coast Range and eastward to the more broken mountainous reaches of the Cascade Range, the rate of land clearing slowed until in the past 20 to 30 years the annual increase in agricultural land has been slight. The 1952 reinventory classified a total of 184 thousand acres in nonforest use of which 161 thousand acres was in agriculture, and 23 thousand acres consisted of town sites, mountain meadows and barrens above timberline. The area classified as forest land was 1,373 thousand acres.



FOREST LAND

A total of 1,214 thousand acres, 88 percent of the forest land area, was classed as commercial forest land, i.e., physically capable of producing usable crops of wood and not withdrawn from timber utilization. The 12 percent classed as noncommercial forest land, consisted of 77 thousand acres of reserved commercial forest land in the Mount Rainier National Park and national forest wild areas, and 82 thousand acres of steep, rocky, high mountainous forest land incapable of growing merchantable timber.

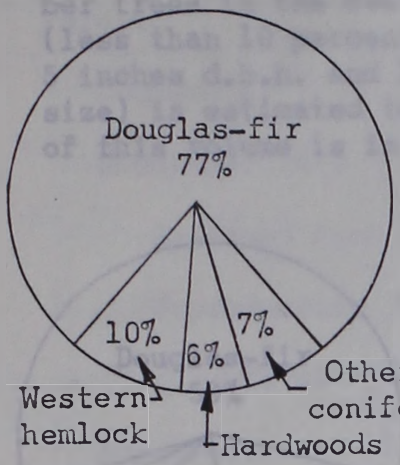
Stand-Size and Condition Classes



Classification of the unreserved commercial forest land by stand-size or condition class found 626 thousand acres occupied by saw-timber stands (trees 11" d.b.h. and larger). Pole-timber stands (trees 5" - 11" d.b.h.) covered 243 thousand acres, and seedling and sapling stands (trees 0" - 5" d.b.h.) stocked 284 thousand acres. The 61 thousand found to be nonstocked consisted of 37 thousand of recent clear-cut land (cut 1940-1952), 18 thousand of old cut-over area (cut prior to 1940) and 6 thousand of deforested burn.

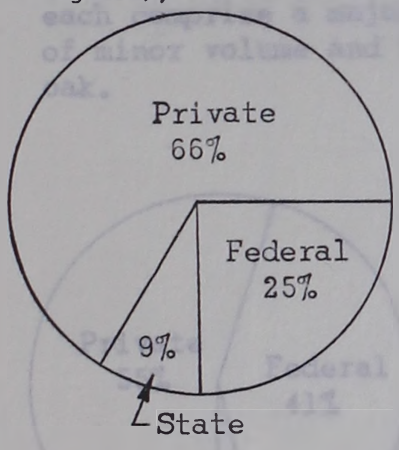
Commercial Forest Land by Type

The area of stocked unreserved commercial forest land totals 1,152 thousand acres. On 892 thousand acres, slightly more than three-fourths of the total, Douglas-fir is the key species. It predominates throughout practically all of the western half of the county, and on the lower slopes and benches of the eastern half. At times it forms practically pure stands; in mixed stands its principal associates are western hemlock, grand fir, and western redcedar. Douglas-fir is predominant on 75 percent of the total saw-timber area and on 81 percent of the area of young-growth stands. Types in which western hemlock is the majority species cover 111 thousand acres on the middle slopes and benches; it comprises the type on 12 percent of the saw-timber area but only 7 percent of the young-growth area. Other conifer types cover 84 thousand acres, most of them of varying mixtures in which Pacific silver fir is usually the key species with mountain hemlock, western hemlock, noble fir, and alpine fir among the associates. These mixed stands occupy the upper slopes and ridges of the mountainous eastern portion. Hardwood types occur on 65 thousand acres in small tracts on the bottomlands and lower slopes along the stream courses. They are chiefly of red alder, frequently in pure stands; bigleaf maple and black cottonwood are associates in mixed stands.



Ownership of Commercial Forest Land

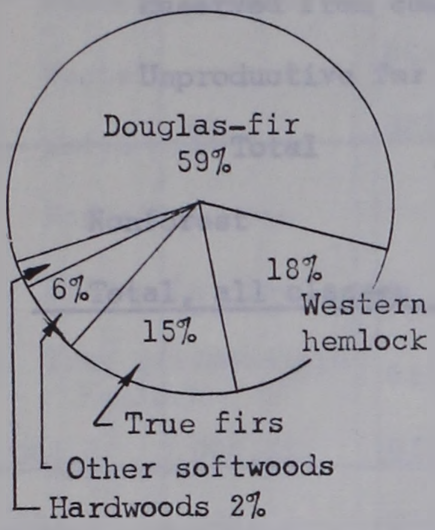
A total of 803 thousand acres of the commercial forest land, approximately two-thirds, is in private ownership. Fifty-two percent of this private acreage is owned by some 7 or 8 timber corporations classed as large (owners of more than 50 thousand acres in the Pacific Northwest region); 10 to 12 medium-size owners (from 5 thousand to 50 thousand acres) hold 12 percent; and owners of the small class (less than 5 thousand acres) have the remaining 36 percent. Included in the private holdings are 55 percent of the total saw-timber acreage, 78 percent of the young-growth area, and 74 percent of the nonstocked area. Local public agencies--State of Washington, Lewis County, and municipalities--own a total of nearly 104 thousand acres of which all but a few hundred acres is in State ownership. Included are 4 percent of the saw timber, 13 percent of the young growth, and 18 percent of the nonstocked. The area federally owned or managed totals 307 thousand acres; of this approximately 305 thousand is in national-forest ownership in the Gifford Pinchot and Snoqualmie National Forests (fig. 1). Public domain lands total about 2 thousand acres, and Indians own 2 hundred acres, managed by the Federal Government. The national-forest lands include 41 percent of the saw timber, 9 percent of the young growth and 8 percent of the nonstocked.



TIMBER VOLUME

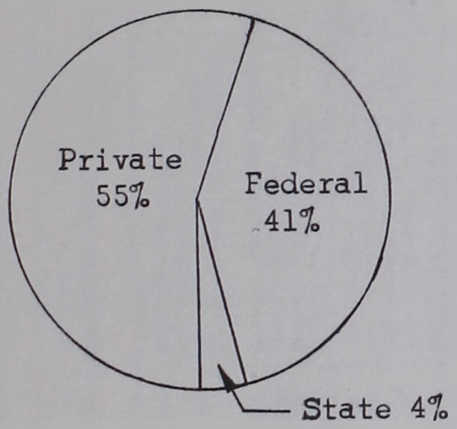
The net volume of live saw-timber trees (11 inches d.b.h. and larger) on unreserved commercial forest land is estimated to be 29,890 million board feet, log scale, Scribner rule. Of this volume 29,466 million is in saw-timber stands; the remaining 424 million is in scattered saw-timber trees in the overstory of young-growth stands or on nonstocked areas (less than 10 percent stocked). Net volume of growing stock (live trees 5 inches d.b.h. and larger, including trees of both pole- and saw-timber size) is estimated to be 5,975 million cubic feet; all but 329 million of this volume is in saw-timber stands.

Volume of Saw Timber by Species



The live saw-timber volume of softwood species totals 29,203 million board feet; the volume of hardwood species 687 million. The predominant species in the county, Douglas-fir, has a total volume of 17,713 million board feet, almost three-fifths of the total. Of interest is the size of the Douglas-fir timber: 18 percent is in trees 11" - 21" d.b.h., 22 percent in 21" - 31" class, 18 percent in 31" - 41" class, and 42 percent in 41" plus class. Of the other important species in the county, western hemlock has a total of 5,453 million board feet. The true firs total 4,414 million, of which Pacific silver fir comprises one-half and most of the remainder is noble fir; there is a small volume each of grand fir and alpine fir. The "other" softwood species have a combined total of 1,623 million board feet, a very large portion of which is western redcedar; those of minor volumes include western white pine, mountain hemlock, lodgepole pine, and a trace of Sitka spruce. Bigleaf maple and red alder each comprise a major portion of the hardwood volume; black cottonwood is of minor volume and there are traces each of Oregon ash and Oregon white oak.

Ownership of Saw-Timber Volume



The privately held live saw-timber volume amounts to 16,524 million board feet, well over half of the total. The nonfederal public agencies own 1,238 million, nearly all of which is in State of Washington ownership. The volume that is federally owned or managed totals 12,128 million, of which 12,038 million is on national-forest lands; public domain lands have 88 million; and Indians own 2 million.

Table 1.--Land area by major classes of land, 1952

Class of land	Area
	Acres
Forest:	
Commercial	1,213,700
Noncommercial:	
Reserved from commercial timber use	77,190
Unproductive for timber use	82,020
Total	1,372,910
Nonforest	184,460
Total, all classes	1,557,370

Table 2.--Area of commercial forest land by ownership and stand-size class, 1952

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling and sapling stands	Nonstocked areas
	Acres	Acres	Acres	Acres	Acres
Private	802,940	344,020	182,080	231,280	45,560
State	102,820	24,660	26,130	41,330	10,700
County	160	40	120		
Municipal	820	540	240	40	
Federally owned or managed:					
Public domain	2,090	1,870	160	60	
Indian	200	40	160		
National forest	304,670	254,460	33,810	11,300	5,100
Total Federal	306,960	256,370	34,130	11,360	5,100
All ownerships	1,213,700	625,630	242,700	284,010	61,360

Table 3.--Area of commercial forest land by major forest type and stand-size class, 1952

Forest type	Total	Saw-timber stands		Pole-timber stands	Seedling and sapling stands	Non-stocked areas
		Old growth	Young growth			
	Acres	Acres	Acres	Acres	Acres	Acres
Douglas-fir	892,470	126,000	341,400	204,410	220,660	
Western hemlock	111,060	61,240	11,370	9,520	28,930	
Western redcedar	7,120	1,880	2,300	1,580	1,360	
White pine	2,880	490	1,230	280	880	
Ponderosa pine	40				40	
Lodgepole pine	1,720			40	1,680	
True fir-mountain hemlock	72,040	41,790	21,960	5,030	3,260	
Hardwoods	65,010		15,970	21,840	27,200	
Nonstocked area	61,360					61,360
Total	1,213,700	231,400	394,230	242,700	284,010	61,360

Table 4.--Area of commercial and noncommercial forest land and nonforest land by cover type and ownership class, 1952

(Acres)

Survey type symbol	Cover type	Total	Unreserved								Reserved			
			Total	Private	State	County	Municipal	Federally owned or managed			Total	State	Federally owned or managed	
								Indian	Public domain	National forest			National park	National forest
	ALL LANDS													
	Forest land	1,372,910	1,255,780	805,530	103,700	160	1,060	200	2,190	342,940	117,130	650	34,500	81,980
	Nonforest land	184,460	175,870	171,200	990		190	160	30	3,300	8,590		320	8,270
	Total	1,557,370	1,431,650	976,730	104,690	160	1,250	360	2,220	346,240	125,720	650	34,820	90,250
	COMMERCIAL FOREST LAND													
D5	Douglas-fir large old-growth saw timber (yellow fir)	131,970	126,000	75,300	4,880		160		80	45,580	5,970	610	3,640	1,720
D4	Douglas-fir small old-growth and large young-growth saw timber (red fir)	191,580	180,900	106,030	9,940	40	20		640	64,230	10,680		5,360	5,320
D3	Douglas-fir small young-growth saw timber	162,740	160,500	94,160	7,100		280	40	1,000	57,920	2,240	40	1,520	680
D2	Douglas-fir pole timber	205,560	204,410	151,490	23,930	120	120	120	160	28,470	1,150		640	510
D1	Douglas-fir seedlings and saplings	221,340	220,660	178,580	35,670					6,410	680		680	
H4	Western hemlock large saw timber	72,020	61,240	33,110	1,920		80		40	26,090	10,780			10,780
H3	Western hemlock small saw timber	12,980	11,370	6,660	420				40	4,250	1,610			1,610
H2	Western hemlock pole timber	9,520	9,520	9,000	240					280				
H1	Western hemlock seedlings and saplings	28,930	28,930	24,850	2,930				40	1,110				
C4	Western redcedar large saw timber	1,880	1,880	1,040						840				
C3	Western redcedar small saw timber	2,300	2,300	2,070	40					190				
C2	Western redcedar pole timber	1,580	1,580	1,460	120									
C1	Western redcedar seedlings and saplings	1,360	1,360	1,360										
W4	White pine large saw timber	490	490	490										
W3	White pine small saw timber	2,680	1,230							1,230	1,450		1,450	
W2	White pine pole timber	1,560	280							280	1,280		1,160	120
W1	White pine seedlings and saplings	880	880							880				
P1	Ponderosa pine seedlings and saplings	40	40	40										
LP2	Lodgepole pine pole timber	40	40	40										
LP1	Lodgepole pine seedlings and saplings	1,680	1,680	1,680										
WF4	White fir large saw timber	1,150									1,150		1,150	
WF2	White fir pole timber	650									650		650	
FM4	True fir-mountain hemlock large saw timber	68,360	41,790	7,460						34,330	26,570		4,320	22,250
FM3	True fir-mountain hemlock small saw timber	32,980	21,960	2,490						19,470	11,020		360	10,660
FM2	True fir-mountain hemlock pole timber	6,630	5,030	160			120			4,750	1,600			1,600
FM1	True fir-mountain hemlock seedlings and saplings	3,500	3,260	120	200		40			2,900	240			240
HD4	Hardwood large saw timber	2,780	2,780	2,540	160				40	40				
HD3	Hardwood small saw timber	13,310	13,190	12,670	200				30	290	120		120	
HD2	Hardwood pole timber	21,840	21,840	19,930	1,840			40		30				
HD1	Hardwood seedlings and saplings	27,200	27,200	24,650	2,530				20					
X	Recent clear-cut area nonstocked	36,930	36,930	26,670	8,090					2,170				
X0	Old clear-cut area nonstocked	17,990	17,990	15,020	2,170					800				
F	Area deforested by fire	6,280	6,280	3,710	440					2,130				
WT	Area deforested by wind	160	160	160										
	Total	1,290,890	1,213,700	802,940	102,820	160	820	200	2,090	304,670	77,190	650	21,050	55,490
	NONCOMMERCIAL FOREST LAND													
NR	Noncommercial rocky	35,000	26,380	2,590	880		240		100	22,570	8,620		4,570	4,050
SA	Subalpine	47,020	15,700							15,700	31,320		8,880	22,440
	Total	82,020	42,080	2,590	880		240		100	38,270	39,940		13,450	26,490
	NONFOREST LAND													
A	Agriculture	161,430	161,430	160,330	870			160		70				
G	Grass and brush	7,690	1,520	680						840	6,170		40	6,130
O	Open--nonvegetative	15,340	12,920	10,190	120		190		30	2,390	2,420		280	2,140
	Total	184,460	175,870	171,200	990		190	160	30	3,300	8,590		320	8,270

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Table 5.--Area of commercial forest land by generalized forest type and ownership class, 1952

(Acres)

Generalized forest type	Total	Unreserved								Reserved			
		Total	Private	State	County	Municipal	Federally owned or managed			Total	State	Federally owned or managed	
							Indian	Public domain	National forest			National park	National forest
Conifer saw timber													
Types D3, D4, D5, H3, H4, C3, C4, W3, W4, WF4, FM3 and FM4.													
Uncut	638,610	567,140	295,050	21,600	40	540	40	1,720	248,150	71,470	650	17,800	53,020
Selectively cut	42,520	42,520	33,760	2,700				80	5,980				
Total	681,130	609,660	328,810	24,300	40	540	40	1,800	254,130	71,470	650	17,800	53,020
Conifer pole timber													
Types D2, H2, C2, W2, LP2, WF2 and FM2													
On cutovers	181,990	181,990	156,650	22,880	120	80	120		2,140				
On burns	40,960	38,510	5,500	1,050		160		160	31,640	2,450		2,450	
On plantations	2,590	360		360						2,230			2,230
Total	225,540	220,860	162,150	24,290	120	240	120	160	33,780	4,680		2,450	2,230
Conifer seedlings and saplings													
Types D1, H1, C1, W1, P1, LP1 and FM1													
On cutover	237,570	237,570	199,180	36,750				40	1,600				
On burns	9,680	8,760	570	200		40			7,950	920		680	240
On plantations	10,480	10,480	6,880	1,850					1,750				
Total	257,730	256,810	206,630	38,800		40		40	11,300	920		680	240
Recent clear-cut areas, nonstocked													
Type X	36,930	36,930	26,670	8,090					2,170				
Nonstocked clear-cut, burned-over, and windthrown areas. Types XO, F, and WT	24,430	24,430	18,890	2,610					2,930				
Hardwoods													
Types HD1, HD2, HD3, and HD4	65,130	65,010	59,790	4,730			40	90	360	120		120	
Total	1,290,890	1,213,700	802,940	102,820	160	820	200	2,090	304,670	77,190	650	21,050	55,490

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Table 6.--Net volume of live saw timber[1/] and growing stock[2/] on commercial forest land by ownership class, 1952

Ownership class	Saw timber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Private	16,524	17,803	3,353
State	1,210	1,305	259
County	2	2	1
Municipal	26	28	5
Federally owned or managed:			
Public domain	88	95	17
Indian	2	2	1
National forest	12,038	12,959	2,339
Total Federal	12,128	13,056	2,357
All ownerships	29,890	32,194	5,975

1/ Includes live trees 11.0 inches diameter breast height and larger measured in board feet.

2/ Includes live trees 5.0 inches diameter breast height and larger measured in cubic feet.

Table 7.--Net volume of live saw timber and growing stock on commercial forest land by stand-size class, 1952

Stand-size class	Saw timber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Saw-timber stands	29,466	31,712	5,646
Pole-timber stands	365	415	296
Seedling and sapling stands	49	55	29
Nonstocked areas	10	12	4
Total	29,890	32,194	5,975

Table 8.--Net volume of live saw timber and growing stock on commercial forest land by species, 1952

Species	Saw timber		Growing stock
	Million board feet, log scale, Scribner rule	Million board feet, International ¼-inch rule	Million cubic feet
Softwoods:			
Douglas-fir	17,713	19,017	3,228
Western hemlock	5,453	5,889	1,208
Mountain hemlock	78	84	19
Sitka spruce	3	3	1
Western redcedar	1,185	1,256	238
Western white pine	334	361	73
Lodgepole pine	23	27	7
Pacific silver fir	2,231	2,410	517
Noble fir	1,777	1,919	306
Grand fir	367	396	69
Alpine fir	39	42	24
Total	29,203	31,404	5,690
Hardwoods:			
Red alder	295	339	169
Bigleaf maple	312	358	98
Black cottonwood	77	89	15
Oregon ash	1	1	1
Oregon white oak	2	3	2
Total	687	790	285
All species	29,890	32,194	5,975

Table 9.--Net volume of Douglas-fir live saw timber on commercial forest land by diameter-class group and log rule, 1952

Diameter class and log rule	Volume
	Million board feet
11.0" to 20.9" d.b.h.	
Scribner rule	3,113
International ¼-inch rule	3,611
21.0" to 30.9" d.b.h.	
Scribner rule	3,903
International ¼-inch rule	4,215
31.0" to 40.9" d.b.h.	
Scribner rule	3,281
International ¼-inch rule	3,478
41.0" d.b.h. and larger	
Scribner rule	7,416
International ¼-inch rule	7,713
All diameter classes	
Scribner rule	17,713
International ¼-inch rule	19,017

Table 10.--Net volume of all timber on commercial forest land by class of material and species group, 1952

Class of material	Total	Softwoods	Hardwoods
	Million cubic feet	Million cubic feet	Million cubic feet
Growing stock:			
Saw-timber trees:	5,374	5,118	256
Sawlog portion	4,998	4,760	238
Upper stem portion	376	358	18
Total	5,374	5,118	256
Pole-timber trees	601	572	29
Total growing stock	5,975	5,690	285
Other material:			
Sound cull trees	1	1	
Rotten cull trees	70	65	5
Salvable dead trees	122	122	
Total other material	193	188	5
Total, all timber	6,168	5,878	290

Table 11.--Average annual commodity drain on live saw timber and growing stock on commercial forest land by species group, for the period 1948-1952 incl.

Species group	Saw timber						Growing stock		
	Timber-products output	Logging residual	Commodity drain 1/	Timber-products output	Logging residual	Commodity drain 1/	Timber-products output	Logging residual	Commodity drain 1/
	Thousand board feet, log scale, Scribner rule			Thousand board feet, International ¼-inch rule			Thousand cubic feet		
Softwoods	609,021	14,616	623,637	654,922	15,718	670,640	106,846	12,116	118,962
Hardwoods	1,194	29	1,223	1,373	33	1,406	442	50	492
Total	610,215	14,645	624,860	656,295	15,751	672,046	107,288	12,166	119,454

1/ Total of timber-products output and logging residual. Timber-products output is the portion of the inventory volume removed from the woods; logging residual is the portion cut or killed in logging not removed from the woods.

FOREST SURVEY PROCEDURE

The procedures used in the second Forest Survey reinventory of Lewis County were materially different from the procedures used in the initial inventory and first reinventory. This change in procedures accounts for some significant differences in both the forest-area and timber-volume statistics obtained. Therefore, a brief description of each of the procedures seems desirable.

Initial Inventory

The initial inventory of the county was conducted in 1931 by what was known as the "compilation method." In this method existing information on forest types, timber cruises, and other pertinent data were collected from private timber owners and various public agencies. These data were checked in the field for reliability, and were then adjusted to the specifications and standards of Forest Survey. Forest-type and timber-volume data for areas not covered by existing information were obtained through intensive field reconnaissance.

All land in the county was classified as either forest or nonforest. Forest land was further classified as commercial or noncommercial; the commercial forest land was still further classified by type, stand-size class and, in case of young-growth stands, by stocking and age classes. These types and classes were delineated on 1-inch-to-the-mile base maps of each township. These township type maps were then superimposed over ownership-status plats and dot-counted to obtain forest-type-area statistics by ownership class. Type delineations on the township maps were traced on a base map of the county to form a county forest type map.

In-place, timber-volume estimates were based on the existing cruise data collected from private and public sources, on field cruises, and on ocular estimates. Volume of young-growth saw timber was computed by applying yield-table values, adjusted for age of stand, stocking density, and site, to type acreages.

First Reinventory

The first reinventory, in 1939, included a complete revision of the forest type map of the county. For this revision, records of cutting and other forms of drain, since the original inventory, were obtained from various sources and verified in the field by ground reconnaissance. Areas on which the type had changed due to cutting, restocking of cut-over or burned-over land, and ingrowth of immature stands were remapped on the ground. The ownership status was brought up to date. On the basis of the new ownership data and the revised forest type map, area statistics by forest types were recomputed.

Timber volume estimates for virgin saw-timber stands were based on cruise data collected during the original survey, adjusted for cutting and other drain. Volume estimates for immature stands were determined from yield tables adjusted for site quality, age, and density of stands.

Second Reinventory

In the second reinventory, in 1952, complete revision of the forest type map was obtained through interpretation, classification, and mapping on aerial photos covering all of the land area. In the mapping on aerial photos, types whose classifications were in doubt and species composition of stands were checked in the field. The use of aerial photos in mapping resulted in type delineations of much greater accuracy and detail than were possible through the ground reconnaissance employed in the initial inventory and first reinventory. In the preparation of a revised type map, the delineations on the aerial photos were transferred to a 1-inch county base map through use of a photo projector. The new type map was then superimposed over a current ownership-status map of complete county coverage and a dot count made of forest type areas by ownership class.

Volume estimates each of live saw timber, growing stock, and salvable dead material were calculated by applying average per-acre volumes to the appropriate forest type acreages. The average per-acre volumes for saw-timber stands and pole-timber stands were obtained through a sampling procedure in which the stands were measured on randomly selected plots. Intensity of the sampling was so designed as to produce a total estimate of volume in the county of a specified sampling accuracy set by Forest Survey. In the random selection of samples each individual saw-timber or pole-timber stand in the county had an equal chance of being selected. A sample consisted of a cluster of 3 one-fifth-acre circular plots spaced at regular 6-chain intervals. A total of 131 plot clusters, or 393 one-fifth-acre plots was taken in saw-timber and pole-timber stands.

Average per-acre volumes for seedling and sapling stands and non-stocked areas were obtained through an aerial-photo-plot sampling procedure. A large number of one-acre photo plots was taken in a modified systematic-random pattern. By photo interpretation, estimates were made of average number of trees per acre of both saw-timber and pole-timber size, average crown diameter, and total tree height. Gross volume of the average tree was obtained from photo volume tables and then adjusted for defect and breakage in order to obtain net volume.

ACCURACY OF DATA

Forest Area

In the reinventory of the county, in-place mapping of the forests and their classification by forest type, stand-size class, or condition

class were on the basis of 100-percent coverage. Thus no error because of sampling was involved. Errors due to techniques or judgment in the field and in office computation of data were possible, but difficult to evaluate. Throughout all phases of the work close supervision and frequent checks assured a high level of accuracy and uniformity of standards.

Timber Volume

For the timber volume, derived from sampling surveys, the chances are two out of three that the estimated total saw-timber volume in the county does not vary in either direction from the true volume more than ± 5.52 percent; the estimated total growing-stock volume does not vary more than ± 4.06 percent.

COMPARISON OF INVENTORIES

Due to considerable differences in Forest Survey specifications, standards of utilization, and survey procedure, a direct comparison of many of the statistics resulting from the 1952 reinventory, as shown in tables 1 to 10, with those from the initial inventory in 1931 and first reinventory in 1939 is not possible. However, some of the statistics can be compared after adjustments have been made for differences in specifications and standards.

Forest Land

The forest land areas, classified by stand-size and condition classes, resulting from the three inventories, are shown in the table below. In this comparison the area of commercial forest land both in unreserved and reserved ownership status has been combined. The 1952 acreage by stand-size and condition class shown in tables 2 and 3 of this report is the area of only the unreserved commercial forest land.

Changes in Forest Land by Stand-Size and Condition Classes Between Inventories

Inventory	Total forest land	Commercial forest land (Unreserved and reserved)					Noncommercial forest land
		Total	Saw timber	Pole timber	Seedlings and saplings	Nonstocked area	
	Thousands of acres						
1931	1,393	1,344	892	79	170	203	49
1939	1,381	1,329	1/ 807	90	257	175	52
1952	1,373	1,291	2/ 697	247	285	62	82

1/ Includes 3 thousand acres of selectively cut saw timber.
2/ " 43 " " " " " " " "

With the exception of the seedling and sapling stands and nonstocked areas, the acreages for a given class are on a comparable basis. The saw-timber acreages, for instance, include stands 11.0 inches d.b.h. and larger; the pole-timber acreages include stands 5.0 to 10.9 inches d.b.h. The seedling and sapling acreages for all three inventories include stands from 0 to 4.9 inches d.b.h., but those for 1931 and 1939 do not include stands on areas clear-cut in the prior 10 years that were restocked at time of the inventory; such land was included in the nonstocked class. The 1952 acreage does include the area of seedling and sapling stands on recently clear-cut land, cut in prior 10 years, if they were found to be established at time of the inventory. This difference in classification procedure has a corresponding effect on the acreages of nonstocked areas--the 1931 and 1939 acreages included all recently clear-cut land, cut in prior 10 years, regardless of status of restocking at time of inventory; the 1952 acreage does not include the area of such land as had become restocked or had advanced growth in 1952.

The decrease in area of 20 thousand acres of forest land between 1931 and 1952 is due in part to land clearing for nonforest use and in part to a difference between inventories in type classification and mapping. The use of aerial photos in the 1952 inventory permitted closer and more detailed mapping than did the ground reconnaissance in the two earlier inventories. Similarly, the decrease during the 21-year interval in total area of commercial forest land and increase in area of noncommercial forest land were due largely to a difference in classification between inventories.

The net decrease of 195 thousand acres in saw-timber area, about 22 percent, is the result of large-scale logging operations which are estimated to have cut over an average of approximately 15 thousand acres annually during the 21-year period. Offsetting the decrease in saw-timber area due to cutting was the substantial area of pole-timber stands that grew into saw-timber size. The very material increase in both pole stands and seedling and sapling stands indicates a favorable rate of restocking of cut-over lands and growth in the past two decades.

Timber Volume

Direct comparison of the total timber volume obtained in the 1952 inventory with the volumes obtained in the 1931 and 1939 inventories is not possible. One reason is that the minimum diameter specification for saw timber which was 15 inches in the 1931 and 1939 inventories was lowered to 11 inches in 1952. A second reason is that during the 21-year interval there had been much intensification of timber utilization on logging operations; in recent years more of the gross stand volume is being removed from the woods as timber products. In the 1952 inventory this intensification was accounted for by using volume tables that gave significantly greater values for a tree of a given size than did

the tables used in the two earlier inventories. A third reason is the inclusion in 1952 of the volume in scattered trees in the overstory of seedling and sapling stands and including a small volume on cut-over and burned-over lands classed as nonstocked.

A comparison of board-foot volumes in saw-timber trees in saw-timber and pole-timber stands only is possible after they are put on the same basis of specifications and standards. The 1931 unreserved and reserved volume adjusted to the 11-inch minimum diameter of saw-timber trees and in terms of the volume tables used in the 1952 reinventory would have been 44,356 million board feet, log scale, Scribner rule; the corresponding volume in 1952 was 29,831 million, a decrease of 32.7 percent.

The total cubic-foot volume of growing stock obtained in the 1931 inventory is quite comparable to the volume obtained in 1952 as there were only slight differences in specifications and standards of utilization between inventories. The total volume of all trees 5.0 inches d.b.h. and larger in all stands, in both unreserved and reserved ownerships, was 8,769 million cubic feet in 1931; in 1952 it was 5,975 million, a decrease of 31.9 percent.

DEFINITION OF TERMS USED

Land Area

Total Land

Includes dry land and unmeandered water surface.

Forest Land

Includes (a) land which is at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting an influence on the climate or on the water regime; and (b) land from which the trees described in "(a)" have been removed to less than 10-percent stocking and which has not been developed for other use. Minimum area of forest land recognized in reinventory of the county was 10 acres.

Nonforest Land

Land that does not qualify as forest land. Minimum area recognized in the reinventory of the county was 10 acres.

Forest Land Classes

Commercial Forest Land

Forest land which is producing, or is physically capable of

producing, usable crops of wood, economically available now or prospectively, and not withdrawn from timber utilization.

Reserved from Commercial Timber Use

Forest land withdrawn from timber utilization through statute, ordinance, or administrative order, but which otherwise qualifies as commercial forest land.

Noncommercial Forest Land

Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land and (b) incapable of yielding usable wood products (usually saw timber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Unproductive for Timber Use

Forest land incapable of yielding usable wood products (usually saw timber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Forest Types

Forest Type

A forest stand characterized by the predominance of certain key species--in terms of cubic volume for saw-timber and pole-timber stands, and in number of trees for seedling and sapling stands--or a forest condition such as nonstocked cut-over or burned-over land. The generalized forest types listed in table 3 are of the following composition:

Douglas-fir. Stands comprised of 50 percent or more of Douglas-fir by cubic volume or number of trees.

Western hemlock. Stands comprised of 50 percent or more of western hemlock by cubic volume or number of trees.

Western redcedar. Stands comprised of 40 percent or more of western redcedar by cubic volume or number of trees.

White pine. Stands comprised of 20 percent or more of western white pine by cubic volume or number of trees.

Ponderosa pine. Stands comprised of 20 percent or more of ponderosa pine by cubic volume or number of trees.

Lodgepole pine. Stands comprised of 50 percent or more of lodgepole pine by cubic volume or number of trees.

True fir-mountain hemlock. Stands in which Pacific silver fir comprises 50 percent or more of the cubic volume or number of trees.

Hardwoods. Stands comprised of 50 percent or more of one of the merchantable hardwood species.

Nonstocked area. Cut-over or burned-over area on which the restocking, if any, is less than 10 percent density and which does not support a residual stand meeting minimum saw-timber requirements.

Tree Classes

Saw-Timber Tree

Softwood or hardwood tree 11.0 inches d.b.h. or larger containing at least one 16-foot log to a variable top diameter inside bark approximating 40 percent of diameter breast height, but never less than 8 inches, and in which 25 percent or more of the gross board-foot volume is free from rot and defect.

Pole-Timber Tree

Softwood or hardwood tree 5.0 to 10.9 inches d.b.h. in which 25 percent or more of the gross cubic-foot volume is free from rot and defect.

Cull Tree

Live tree of saw-timber or pole-timber size that is unmerchantable, now or prospectively, because of defect or rot.

Sound cull tree. Live tree of saw-timber or pole-timber size which contains 25 percent or more of sound volume but will not make at least one merchantable log, now or prospectively, because of roughness or poor form.

Rotten cull tree. Live tree of saw-timber or pole-timber size in which less than 25 percent of the total volume is sound.

Salvable Dead Tree

Standing dead or down tree which contains 25 percent or more of sound volume and at least one merchantable log.

Stand-Size Classes

Saw-Timber Stand

Stand of saw-timber trees having a minimum net volume per acre as follows: 5,000 board feet, log scale, Scribner rule, in any species except the pines and hardwoods; 1,500 board feet in the pines and hardwoods.

Old-growth saw-timber stand. Stand in which the majority of the cubic-foot volume is in trees more than about 180 years of age and larger than 21.0 inches d.b.h.

Large old-growth saw-timber stand. Stand in which the majority of the volume is in trees more than 41.0 inches d.b.h.

Young-growth saw-timber stand. Stand in which the majority of the cubic-foot volume is in trees under 180 years of age and from 11.0 to 40.9 inches d.b.h.

Pole-Timber Stand

Stand failing to meet saw-timber-stand specifications but of at least 10-percent stocking of trees 5.0 inches d.b.h. and larger, with at least one-half the minimum stocking in pole-timber trees (5.0 inches to 10.9 inches d.b.h.).

Seedling and Sapling Stand

Stand not qualifying as either saw-timber or pole-timber stand but having at least 10 percent stocking of trees and with at least one-half the minimum stocking in seedlings and saplings (0 inch to 4.9 inches d.b.h.).

Timber Volume

Live Saw-Timber Volume

Net volume in board feet of live saw-timber trees:

Scribner rule. The common board-foot rule used in determining log-scale volume of saw timber in this region. This rule underestimates, particularly in case of timber of the smaller diameters, the volume of lumber that could be produced from the timber.

International $\frac{1}{4}$-inch rule. The standard board-foot rule adopted by the Forest Service in the presentation of Forest Survey volume statistics. Volumes in this rule approximate lumber tally.

Growing Stock

Net volume in cubic feet of live saw-timber trees and live pole-timber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Saw-Timber Volume

Net volume in board feet of live and salvable dead saw-timber trees to a merchantable top.

All-Timber Volume

Net volume in cubic feet of live and salvable dead saw-timber trees and pole-timber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark.

Commercial Tree Species

Tree species that are considered in determining stocking of stands and growing-stock volume. Includes species presently or prospectively usable for commercial timber products.

Commercial tree species in Lewis County include:

Softwoods:

Douglas-fir (Pseudotsuga taxifolia).
Western hemlock (Tsuga heterophylla).
Mountain hemlock (Tsuga mertensiana).
Sitka spruce (Picea sitchensis).
Western redcedar (Thuja plicata).
Western white pine (Pinus monticola).
Lodgepole pine (Pinus contorta).
Pacific silver fir (Abies amabilis).
Noble fir (Abies procera).
Grand fir (Abies grandis).
Alpine fir (Abies lasiocarpa).

Hardwoods:

Red alder (Alnus rubra).
Bigleaf maple (Acer macrophyllum).
Black cottonwood (Populus trichocarpa).
Oregon ash (Fraxinus oregona).
Oregon white oak (Quercus garryana).

Commodity Drain

Commodity Drain on Live Saw Timber

Board-foot volume of live saw-timber trees removed from commercial forest land during a specified year as timber products and that left as logging residue.

Timber-products output. The live saw-timber volume entering into timber products during a specified year.

Logging residue. The live saw-timber volume that is cut or killed in logging during a specified year but is not removed from the forest as timber products.

Commodity Drain on Growing Stock

The cubic-foot volume of live saw-timber and pole-timber trees removed from commercial forest land during a specified year as timber products and left as logging residue.

Timber-products output. The growing stock volume entering into timber products during a specified year.

Logging residue. The volume of growing stock that is cut or killed in logging during a specified year but is not removed as timber products.